

**“Operation Theater Utilization and Most Common Causes of
Delays of Scheduled Surgeries with a View to Optimize the
Utilization.”**

Dissertation Submitted to



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In

Hospital and Health Management

By

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Under the Supervision and Guidance of

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(Professor, IIHMR University)

2023

DECLARATION BY STUDENT

I hereby declare that this dissertation titled **“Operation Theater Utilization and Most Common Causes of Delays of Scheduled Surgeries with a View to Optimize the Utilization”** is the Bonafede record of my original researchwork. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

(Signature)

Name of Student

Date

CERTIFICATE

This is to certify that **Amoli Kashikar** in partial fulfillment of the requirements for the award of the degree of **MBA (Hospital and Health Management)** from the IIHMR University, Jaipur has successfully completed his internship at **Apollo Health City, Hyderabad** during 27th March 2023 to 26th May 2023.

Place:

Date:

Preceptor/Head of the Organization

Name of the organization

CERTIFICATE

This is to certify that dissertation titled **“Operation Theater Utilization and Most Common Causes of Delays of Scheduled Surgeries with a View to Optimize the Utilization”** is a record of the research work undertaken by **Amoli Kashikar** in partial fulfillment of the requirements for the award of the degree of **MBA (Hospital and Health Management)** from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

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Date:

Date:

Abstract

BACKGROUND:

The ability of a hospital to provide the best possible quality care is mainly based on how well and optimally the operation rooms are utilized and how resources are efficiently utilized. When operating rooms are used efficiently, this means that the resources of the hospital are being utilized to the most optimal level that is possible and this also helps to reduce the long waiting time for the patients and enhanced the delivery of healthcare services. Thus, it is important to carefully plan and schedule the surgeries and manage the resources including surgical teams, anesthetist team, and equipment to avoid such delays. This study aims to describe the process flow of operation theatre, analyze the utilization rate of the operating rooms, and find out the reasons behind the delays of surgeries.

OBJECTIVES:

- To describe the process flow of of operation theatre.
- To calculate and determine the utilization rate of operation theatres.
- To identify the most common reasons behind the delays of scheduled surgeries.

METHODS:

The study design used id descriptive Cross-Sectional Study. Study location is Apollo Hospitals, Hyderabad (550 bedded multi-speciality hospital). Study Duration is 8 weeks (3rd April 2023 to 26th May 2023). Sample size is 527 patients, both insurance and cash patients who have undergone surgical procedures at Apollo Hospitals, Hyderabad under 4

OTs of specific departments such as Orthopaedic OT, General Surgery OT, Oncology OT, and Robotic Surgery OT. Included are regularly scheduled cases, which are handled from 8:00 am to 6:00 pm on all business days. Sundays or public holidays and unscheduled or cancelled cases. Emergency cases and cases beyond 6:00 pm are also excluded.

RESULT:

The number of surgeries performed during April 2023 to May 2023 is 527. 264 surgeries were performed in the month of April while 263 surgeries were performed in the month of May 2023. Both the months witnessed maximum surgeries being conducted in General OT and minimum surgeries were conducted in Robotic surgery OT. In the period of 8 weeks, it was observed that number of surgeries in Oncology OT and General OT were increased whereas number of surgeries in Orthopaedic OT were significantly decreased.

Total available hours from April 2023 to May 2023 for all the 4 OTs was 450 hours out of which on an average 315 hours were used. 360 hours were utilised by Orthopaedic OT, 355 hours were utilised by General OT, 303 hours were utilised by Oncology OT and 243 hours were utilised by Robotic surgery OT. Overall utilization percent of 4 OTs in April 2023 to May 2023 was 75 %, 74 %, 63 % and 51 % respectively for Orthopaedic OT, General surgery OT, Oncology OT, and Robotic surgery OT.

It is observed that maximum delays are due to housekeeping staff for shifting the patient late inside the operation theatre, followed by insurance delay, patient arriving late for the surgery, medical state of the patient, early close and delay in start of surgery. Minimum delay is due to surgeon reporting late.

CONCLUSION:

April 2023 to May 2023 saw an overall utilisation rate of 4 operation theatres of 75%, 74%, 63%, and 51% for orthopaedic, general, oncology, and robotic surgery, respectively. The largest downtime is observed in operating rooms for robotic surgery, followed by those for oncology surgery, general surgery, and orthopaedic surgery. This shows that delays for robotic surgery occur most frequently in the operating room, which may be connected to the fact that a smaller number of surgeries are scheduled per day. Oncology operating rooms are also prone to delays, which might occur because of delay in patient's transfer from the wards or delaying the commencement of the treatment. The general and orthopaedic operating rooms see the fewest delays, which can be attributed to either a delay in insurance authorization or a delay in the start of the procedure. Overall, the patient's late relocation into the operating room is blamed for the most delays, followed by insurance delays and patient errors. The following suggestions can aid in boosting the use of operation theatres such as accurate case duration estimations can avoid postponing follow-up surgery, visual dashboards can give real-time patient tracking and status updates in the preoperative setting so that scheduled procedures won't be postponed as a result, a separate operating room should only be used for emergencies, preoperative workups, such as consultations and investigations, can be added to computerised to-do lists, allowing for the tracking of tasks that need to be accomplished before admission on the day of surgery. This can lessen the likelihood that the surgery day will be postponed, and the patient can even look for unfinished preops. Lastly, the operation theatre staff and doctors may benefit from time management training.

Acknowledgement

Words of thanks, however many they may be, cannot adequately describe my gratitude for everyone who has helped me consistently finish my dissertation despite these unplanned and unpredictable situations.

First and foremost, I would like to express my sincere gratitude to Mr Narender Reddy (General Manager, Operations Department), who served as my mentor at Apollo Hospitals, Hyderabad, as well as to Mr Kasi Siva Charan (OT Manager) and Mrs Kala Krishnana (Operations Executive) whose constant support helped me finish this project on schedule. The completion of this project would not have been feasible without their help.

I also want to express my gratitude to Dr. Jagajeet Prasad Singh, my academic advisor (Professor, IIHMR University), who gave me all the support I needed to finish my dissertation. Additionally, I want to thank the Academic Committee and the Placement Committee for their support whenever it was needed.

In closing, I would like to express my sincere gratitude to my friends and family, who served as a pillar of support for me and without whom it would have been challenging to complete this project.

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INTRODUCTION:

The ability of a hospital to provide the best possible quality care is mainly based on how well and optimally the operation rooms are utilized and how resources are efficiently utilized. The purpose of operation theatres is to provide an essential place for surgical procedures, and their effective use is essential for timely and safe surgical procedures without any delays. When operating rooms are used efficiently, this means that the resources of the hospital are being utilized to the most optimal level that is possible and this also helps to reduce the long waiting time for the patients and enhanced the delivery of healthcare services.

“There were delay in starting lists, under-scheduling, interruption due to emergency surgeries, administrative reasons. Induction of anaesthesia and recovery policies were the main factors that account for inefficient use of operating facilities. And the study concluded that the correction of these factors would increase the available operating time by nearly 20%.” (Vinukondaiah K, Ananthakrishnan N, Ravishankar M. 2000;13:118–21)

“Delays in starting the OT table in the mornings cause considerable wastage of productive OT time and lead to cancellations of surgeries in the later part of the day which in turn hampers the daily OT utilization. Therefore, proper communication among surgeon, anaesthesiologist, and nursing staff on the night before surgery can help in morning delays. Room turnover time can be improved by keeping a dedicated theatre for emergency procedures can avoid rescheduling of cases due to last moment entry of emergency cases.” (Lakshmi Bhaskar N, Satish Kumar SN. 2015; 5:427–9)

Operation theatre utilization is defined as the amount of efficiency with which these areas are used to accommodate scheduled operations by also focusing on reducing the delays in surgical procedures and cancellations of surgeries. Thus, it is important to carefully plan and schedule the surgeries and manage the resources including surgical teams, anesthetist team, and equipment to avoid such delays. Theatre utilization is very important for a successful procedure in multi-specialty hospitals where the volume of surgical cases is very high.

About Apollo Hospitals, Hyderabad:

The operating room of Apollo Hospitals in Hyderabad is situated at the hospital's first floor and basement. It is close to the wards, LDR suites, Cath lab, and ICUs, and CSSD is housed inside the OR complex. In total Apollo Hospital has eighteen Operation theatres allotted for different departments. On first floor, OT1 is allotted for general or gastrology surgeries, OT2 is for urology, OT3,5 and 6 is for Orthopaedic surgeries, OT4 and 7 is for neurology, OT8 is for oncology, OT is for ENT, OT10 is for paediatric, vascular and all other surgeries, OT16,17,18,19 is allotted for cardiothoracic surgery. On basement, OT11 is allotted for ophthalmology, OT12 is for robotic surgery, OT14 is for Gynaecology and OT15 is for plastic surgery.

There were two OT reception desks on each floor. There were five pre-op beds and around thirty recovery beds on each floor. Average number of cases done per day were around 75 to 80. Temperature inside the operation room was maintained below 25° C, humidity is maintained around 55% and light should be 2000 lux at the centre of OT table.

After every case, routine cleaning is performed, taking 10 to 15 minutes. After each infected instance, a thorough cleaning is conducted. This procedure takes 30 to 45 minutes. The following quality indicators are tracked: first case delays, unscheduled OT visits brought on by unanticipated surgical difficulties, adherence to the surgical safety checklist, and inconsistencies between pre- and post-operative care.

Methods of sterilization and disinfection:

Sterilisation and disinfection are necessary to keep hazardous microorganisms out of operating rooms. The two strategies are very different from one another, despite their apparent closeness. Sterilisation is the process of eradicating or destroying all microbiological life, including bacteria, viruses, fungi, and spores. Disinfection, on the other hand, is the process of reducing the number of bacteria to a level judged safe for human interaction.

In those operating room facilities, steam sterilisation, which involves exposing the instruments to 121°C high-pressure steam for 15 to 20 minutes, was the most popular method of sterilisation. Dry heat sterilisation employs hot air at a temperature of 160–170°C for two to three hours to destroy microorganisms. Chemicals such as chlorine, hydrogen peroxide, and alcohol are used in disinfection processes. Chemical disinfection entails immersing the instruments in a disinfectant solution for a predetermined amount of time as well as exposing them to the appropriate agents for the predetermined amount of time.

To make sure the techniques are efficient, sterilisation and disinfection processes are routinely observed. Monitoring enables remedial action to be made before any harm is done to patients or personnel and assists in identifying any difficulties or problems with the processes or equipment. Effective sterilisation and disinfection depend on consistent monitoring and adherence to the right procedures and regulations. Operation theatres can keep a clean and safe environment for personnel and patients by adhering to these procedures.

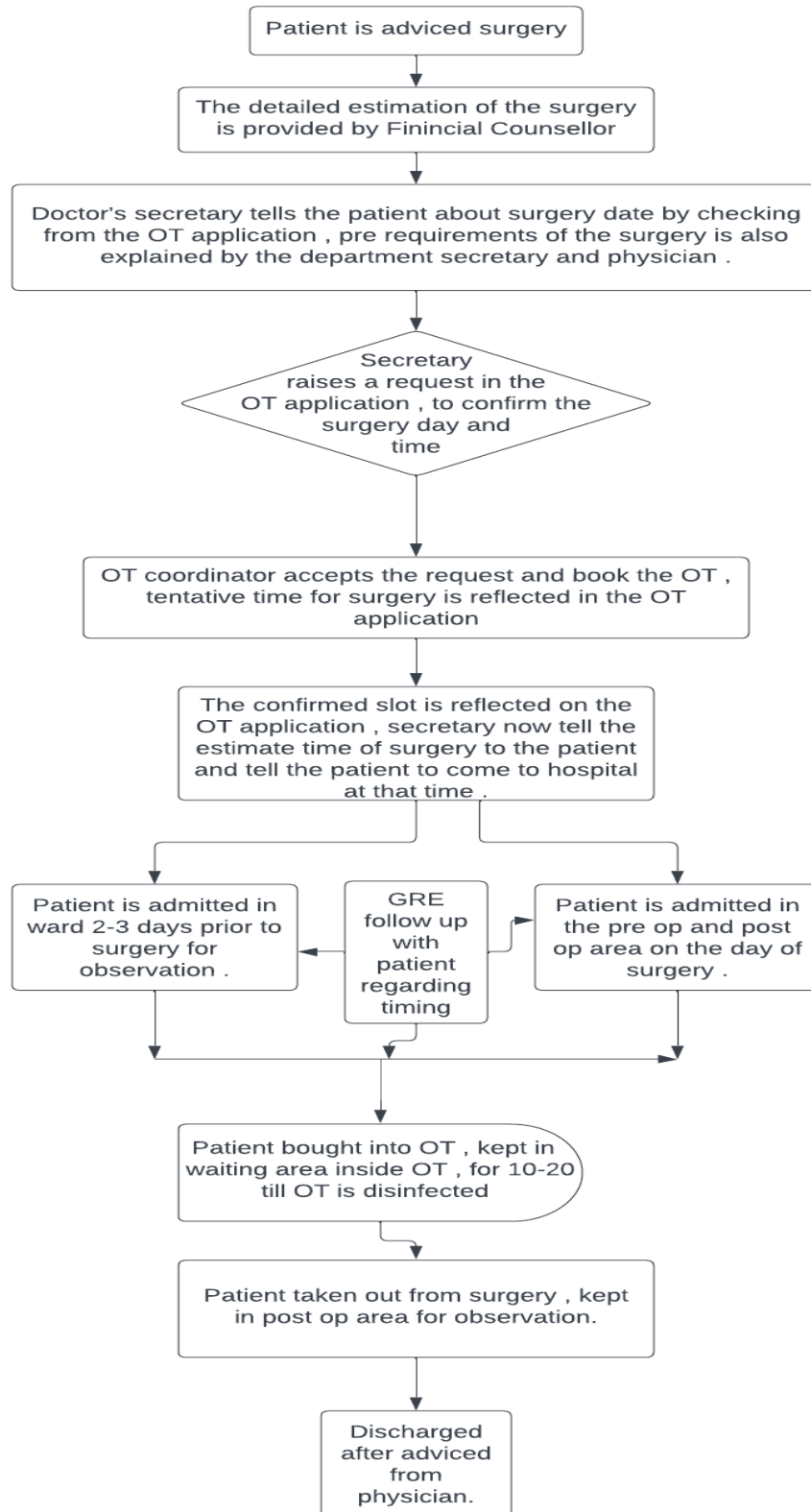
AIMS OF THE STUDY:

- Describe the process flow of surgical procedures.
- Assess how successfully operating rooms are being used in terms of their capacity and availability for scheduled surgeries.
- Pinpoint the major causes of scheduled surgery delays and determine the most common causes of cancellations.

OBJECTIVES:

- To describe the process flow of surgical procedures.
 - To calculate and determine the utilization rate of operation theatres of Apollo hospitals.
- To determine the most frequent reasons for surgery delays.

Process Flow:



REVIEW OF LITERATURE:

Name of Author	Title of study	Salient features
K Vinukondaiah, N Ananthakrishnan and M Ravishankar, 2000 May-Jun;13(3):118-21.	Audit of operation theatre utilization in general surgery	Sample size: 1773 procedures Study location: Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry Findings of the study: Delays in starting lists, inadequate scheduling, interruptions for emergency procedures, administrative reasons, the induction of anaesthesia, and recovery guidelines are the main causes of wasteful usage of operating facilities. By addressing these issues, the operational time would increase by about 20%.
Shraddha Vidyadhar Naik, Vithal Krishna Dhulkhed, and Rewa Hemant Shinde, 2018 Oct-Dec;12(4):797-802.	A Prospective Study on Operation Theatre Utilization Time and Most Common Causes of Delays and Cancellations of Scheduled Surgeries in a 1000-Bedded Tertiary Care Rural Hospital with a View to Optimize	Sample size: 548 Procedures Study location: Rural Maharashtra Findings of the study: With excellent preoperative planning, resource and patient optimisation, and effective coordination between the surgical team including the anaesthesiologists and the nurses, most reasons for surgery delays and cancellations might have been avoided.

	the Utilization of Operation Theatre	
S Talati, AK Gupta, A Kumar, SK Malhotra, and A Jain, 2015 Jan- Mar; 61(1): 3–8.	An analysis of time utilization and cancellations of scheduled cases in the main operation theater complex of a tertiary care teaching institute of North India	Sample size: 325 Procedures Study location: A tertiary care teaching institute of North India. Findings of the study: 73 (22.5%) of the 325 scheduled cases were cancelled, leaving 252 to be operated. The OT table did not start at the specified time on 15 days (15.63%). The mean "Adjusted utilisation" was 39,668 min (86.09%) and the mean "Raw utilisation" was 37,573 min (81.54%) of the total resource hours (46,080 min). The average amount of time for "supportive services" was 5539 minutes (12.02%), "actual surgery" was 28,277 minutes (61.37%), and "room turn over time" was 2095 minutes (5.39%). Lack of operational time was the most often cited reason for cancellations, appearing in 57 instances (78.1%).
Reena Kumar and R.K. Sarma, J 20(6): 1048- 1052.	Operation Room Utilization at AIIMS, a Prospective Study	Sample size: 13,130 Procedures Study location: Main OT complex AIIMS Findings of the study: According to information gathered about surgical waiting lists, the typical wait period for regular surgical treatments was between 6 months and 3 years for various benign diseases and between a few weeks and 3 months for malignant diseases. Despite lengthy dates

		being given, most dated patients show up on the scheduled date, apart from the holiday season. Many of the residents and consultants agreed that the main O.T. time might be used more effectively if minor O.T.s (in the OPDs) received extra input. However, it would require upgrading the minor O.T.'s in terms of staffing, infrastructure, and equipment.
Lakshmi Bhaskar N, Satish Kumar SN.	A study of utilization of operation theatres in a tertiary care teaching hospital, Hyderabad.	Sample size: 8201 surgeries Study location: A study of utilization of operation theatres in a tertiary care teaching hospital, Hyderabad. Findings of the study: The best use of the operation theatre complexes at NIMS was determined to be 72.51% for the period from July 2011 to June 2012. The study recommends the best use of OT time in various healthcare settings, which has traditionally been a field of study for hospital administration.

METHODOLOGY:

The methodology for this study is as follows;

MATERIAL AND METHODS:

1. **STUDY DESIGN:** The study design used is descriptive Cross-Sectional Study
2. **SETTING:** Apollo Hospitals, Hyderabad (550 bedded multi-speciality hospital)

STUDY SAMPLE:

1. **Inclusion criteria:** Included are regularly scheduled cases, which are handled from 8:00 am to 6:00 pm on all business days.
2. **Exclusion criteria:** Sundays or public holidays and unscheduled or cancelled cases. Emergency cases and cases beyond 6:00 pm are also excluded.
3. **Study tools:** Tracker application, OT scheduling software, MS excel.

DURATION OF STUDY: 8 weeks (3rd April 2023 to 26th May 2023)

SAMPLE SIZE: 527 patients, both insurance and cash patients who have undergone surgical procedures at Apollo Hospitals, Hyderabad under 4 OTs of specific departments such as Orthopaedic OT, General Surgery OT, Oncology OT, and Robotic Surgery OT.

SAMPLING TECHNIQUE: Collection of data is of surgical procedures that happen in 4 OTs of specific departments such as Orthopaedic OT, General Surgery OT, Oncology OT, and Robotic Surgery OT during the period of 8:00 am to 6:00 pm.

DATA COLLECTION PROCEDURE: By making observations in the operation theatre and recovery room, analysing data using HMIS, collecting data from excel sheet of patient data and patient record registers, discussing with the management staff and other clinical or paramedical staff of the operation theatre.

DATA ANALYSIS PLAN:

The following parameters were observed for 8 weeks:

- Calculation of total number of surgeries in 4 Operation theatres.
- Calculation of department wise total number of surgeries of 4 Operation theatres.
- Calculate time taken for surgical procedures and time allotted for the procedure.
- Calculate overall utilization percentage for departments.
- Calculate OT start time, which is the moment the patient is moved inside the OT, and any deviation from that time by more than 10 minutes was noted.
- Calculate the period between surgical closure and the patient being moved outside the operating room, with any delay of more than 15 minutes being noted.
- Calculate table turnover time, which is the interval between the previous patient wheeled out of the OT and the subsequent patient wheeled in. Any delay of under 15 minutes was recorded.

The most frequent reasons for timing delays and surgery rescheduling were investigated and examined. A comparative analysis on the OT utilization by OT being utilised vs actual OT functioning hours was done. The following criteria will be used to calculate the theatre usage rate:

$$\frac{\text{Total Operation Theatre Hours used}}{\text{Total available Operation Theatre equipped hours}} \times 100$$

Use of MS excel for the analysis and interpretation of data, PPT for Graphical representation of the data and data visualization techniques such as histograms can be used to visually explore the relationships and identify patterns in the data.

ETHICAL CONSIDERATIONS:

Data security, privacy and confidentiality was maintained all the time during the collection of samples and analysis of the information so it will not reveal the identity of the patient by his or her name or hospital UHID.

IMPLICATIONS OF RESEARCH:

The implications of this research could be significant for the hospital administration, surgeons, and patients. By identifying the most common causes of delays of scheduled surgeries, the hospital can take steps to address them, which would ultimately lead to more efficient use of the operation theatre and better patient outcomes. The study can also help in identifying the specific areas where technology and other interventions can be implemented to optimize operation theatre utilization.

LIMITATIONS:

This study does have some drawbacks. Data was first gathered and examined during the span of 8 weeks. The potential reasons for cancellations were not thoroughly assess. The economic effects of extended OT periods were not assessed. Future research, however, may build on

this study to examine the effects of planned and successful interventions on the OT utilisation rates. Before executing the procedures, these treatments can include structured simulation-based training or the appraisal and implementation of the first case on time start. These and other measures may influence the socioeconomic costs.

RESULTS:

1) To calculate and determine the utilization rate of operation theatres.

To better grasp its consequences, the raw data gathered on the excel sheet is organised in several tables and depicted graphically for analysis and interpretation. 45 working days were observed and total 527 surgical procedures are taken from 4 OTs which are Orthopaedic OT, General OT, Oncology OT, and Robotic surgery OT in the duration of 8 weeks (April to May 2023). Total number of surgeries per week of 4 OTs is represented graphically. After that, time allotted for those surgeries versus actual time available for the surgeries is represented graphically. Lastly, utilisation rate of these cases is represented through graphs.

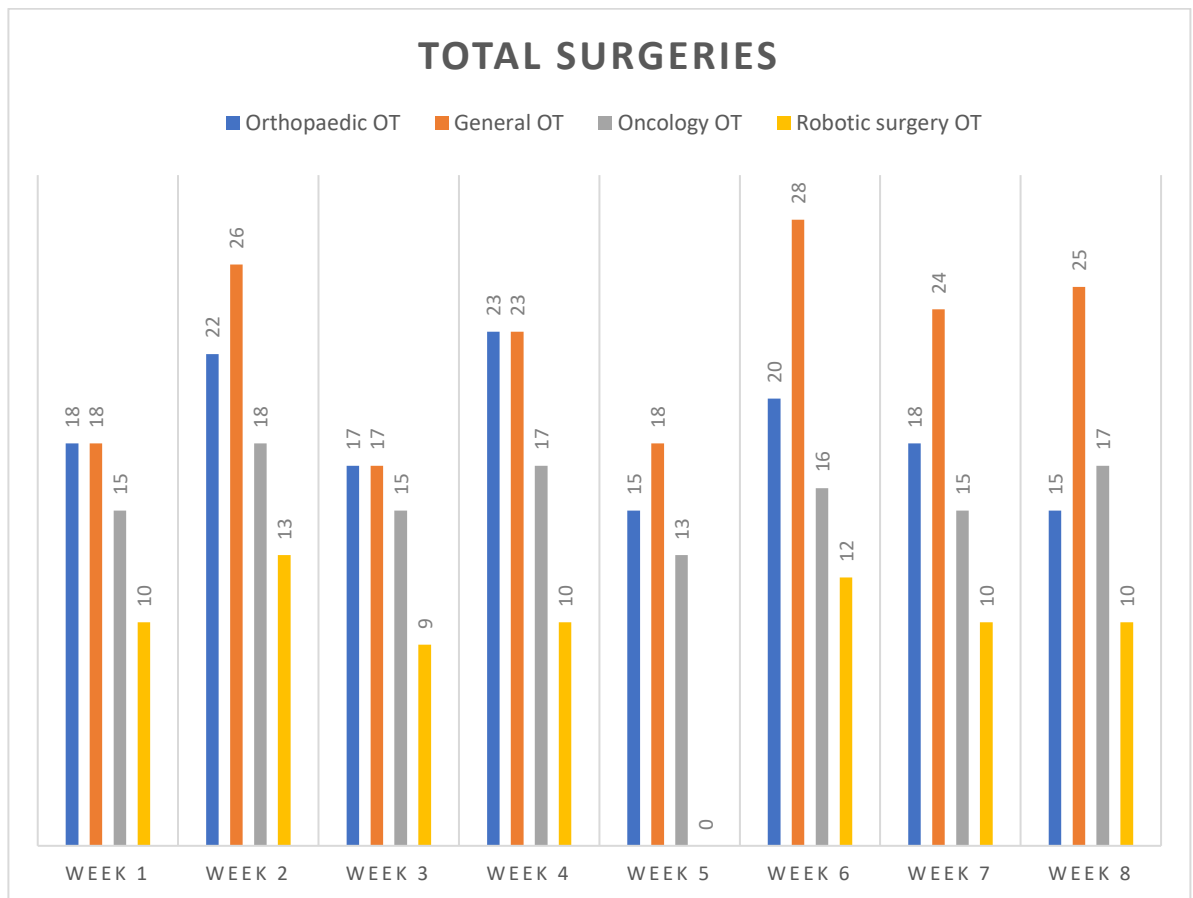


Fig. 1: Figure depicts the comparison of all surgeries of 4 OTs done in the duration of 8 weeks during normal working hours. Highest number of surgeries were performed in General OT, followed by Orthopaedic OT and Oncology OT whereas least number of surgeries were performed in Robotic surgery OT.

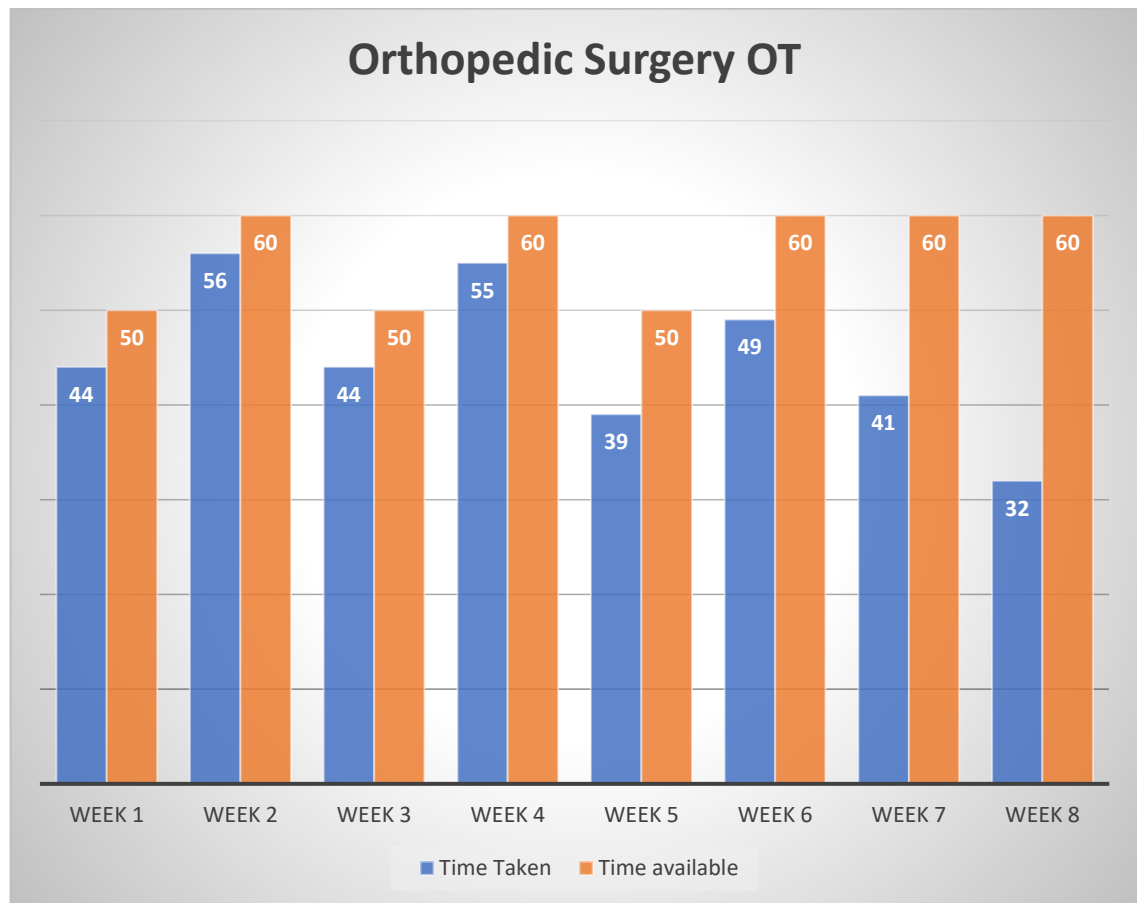


Fig. 2: Figure depicts the comparison of time taken to perform the surgical procedures versus the actual time available in Orthopaedic OT in the duration of 8 weeks during normal working hours. Minimum time consumed to perform orthopaedic surgeries in a week is 32 hrs and maximum time consumed is 56 hrs. Total available hrs in the duration of 8 weeks is 450 hrs. Average time consumed in a week during the period of 8 weeks is 45 hrs.

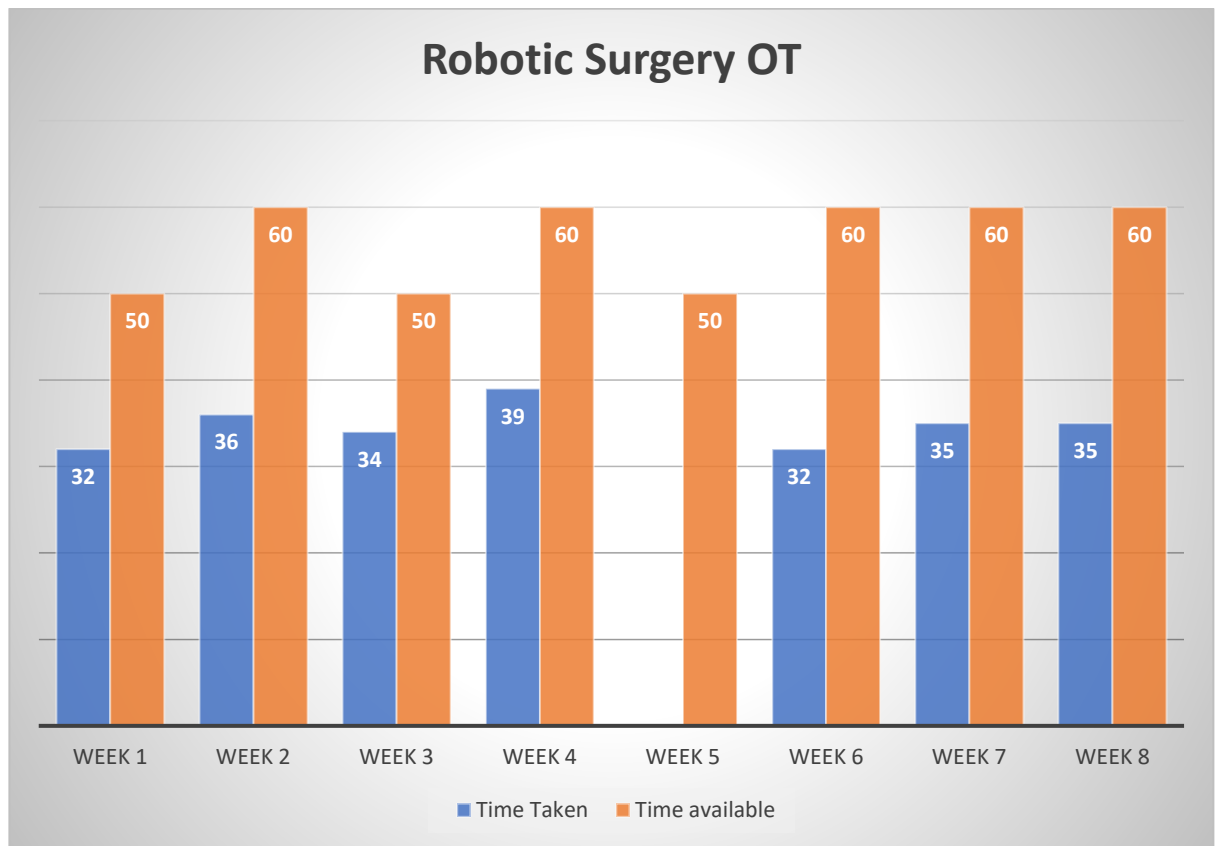


Fig. 3: Figure depicts the comparison of time taken to perform the surgical procedures versus the actual time available in Robotic Surgery OT in the duration of 8 weeks during normal working hours. Minimum time consumed to perform robotic surgeries in a week is 32hrs and maximum time consumed is 39 hrs. Total available hrs in the duration of 8 weeks is 450 hrs. Average time consumed in a week during the period of 8 weeks is 30 hrs.

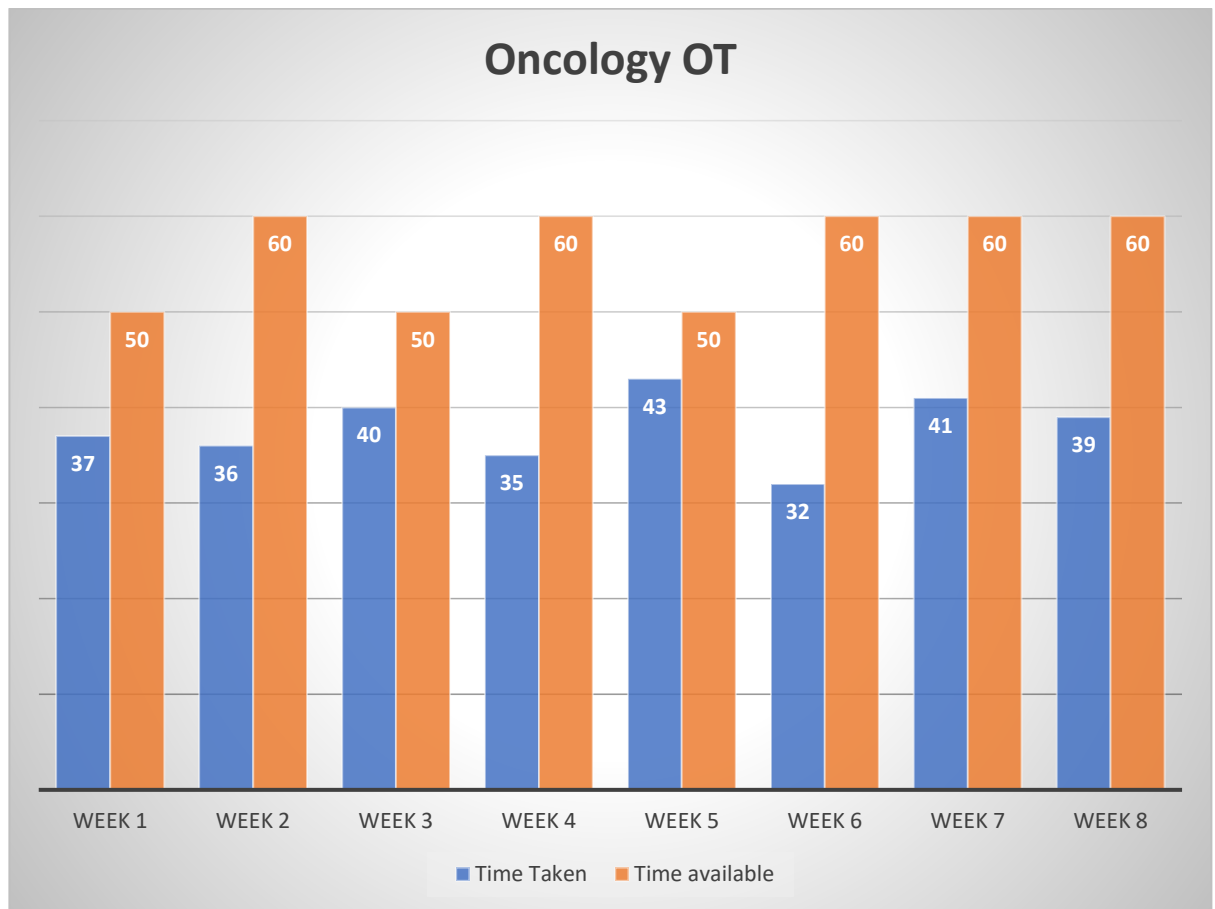


Fig. 4: Figure depicts the comparison of time taken to perform the surgical procedures versus the actual time available in Oncology Surgery OT in the duration of 8 weeks during normal working hours. Minimum time consumed to perform robotic surgeries in a week is 32hrs and maximum time consumed is 43 hrs. Total available hrs in the duration of 8 weeks is 450 hrs. Average time consumed in a week during the period of 8 weeks is 38 hrs.

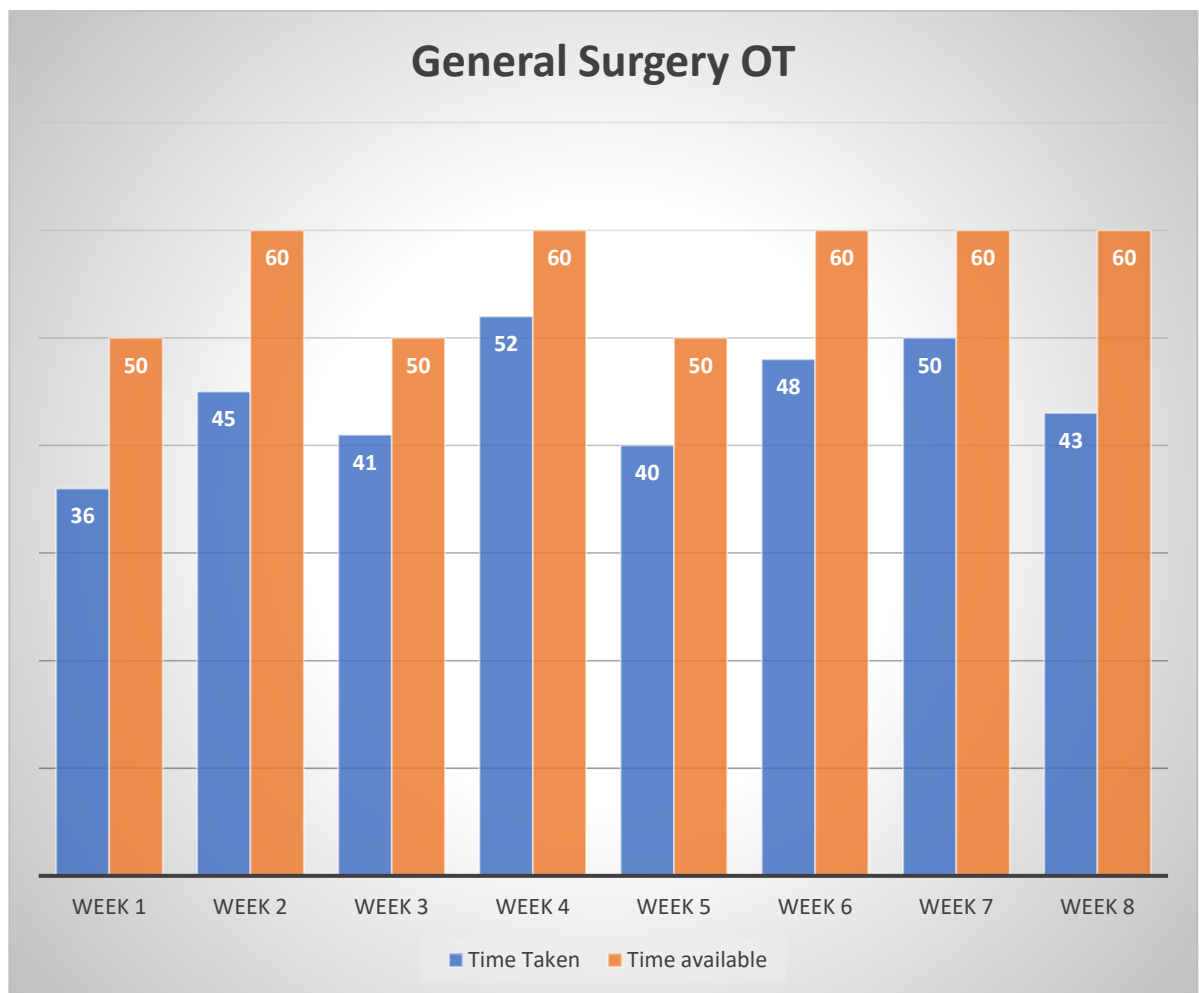


Fig. 5: Figure depicts the comparison of time taken to perform the surgical procedures versus the actual time available in General Surgery OT in the duration of 8 weeks during normal working hours. Minimum time consumed to perform robotic surgeries in a week is 36 hrs and maximum time consumed is 52 hrs. Total available hrs in the duration of 8 weeks is 450 hrs. Average time consumed in a week during the period of 8 weeks is 44 hrs.

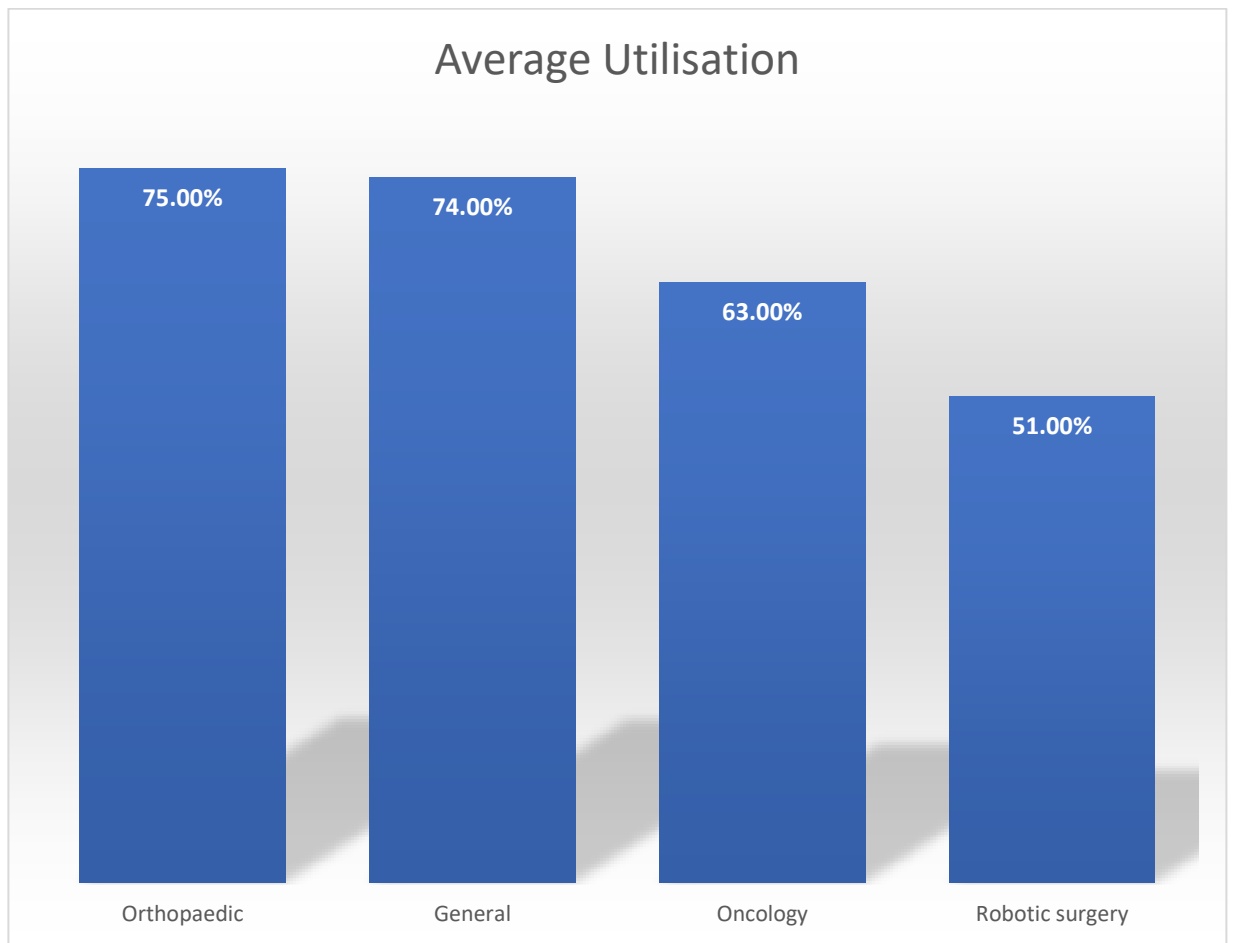


Fig. 6: Figure depicts the average utilisation rate of all the surgical procedures performed in 4 OTs in the duration of 8 weeks during normal working hours. Minimum utilisation is observed in robotic surgery OT and maximum utilisation is observed in orthopaedic OT.

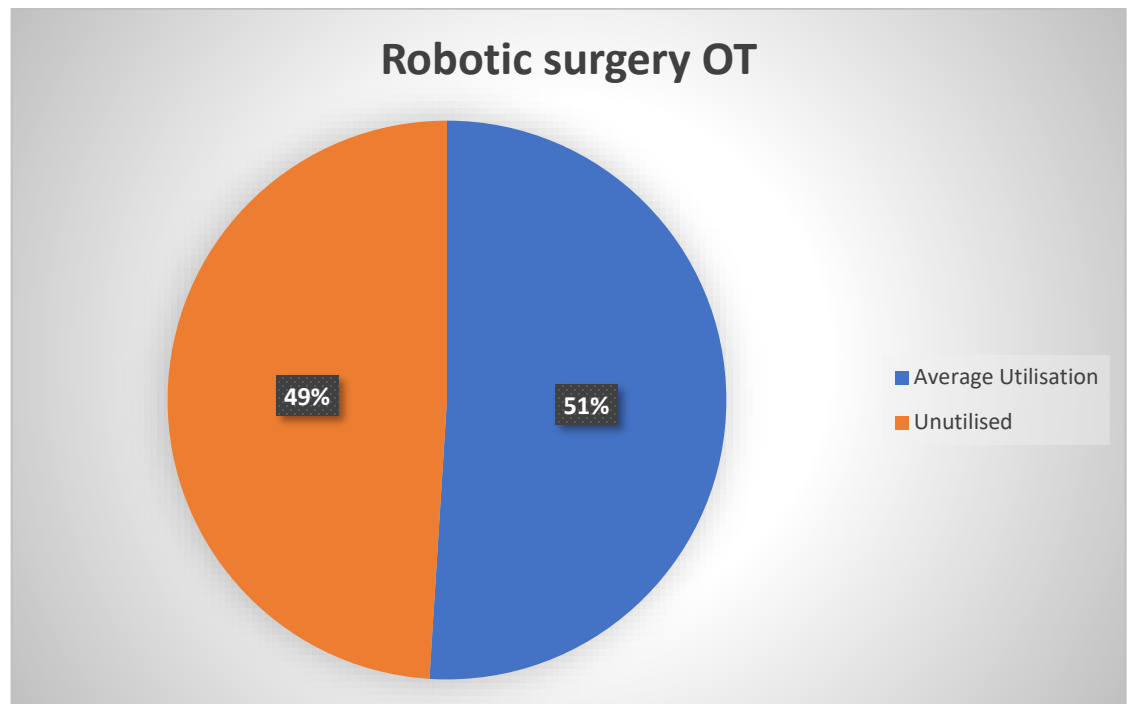


Fig. 7: Figure depicts the average utilisation rate versus percentage of unutilised OT in Robotic Surgery OT in the duration of 8 weeks during normal working hours. It is observed that only 51% OT is utilised and 49% is unutilised which means that Robotic Surgery OT is underutilised.

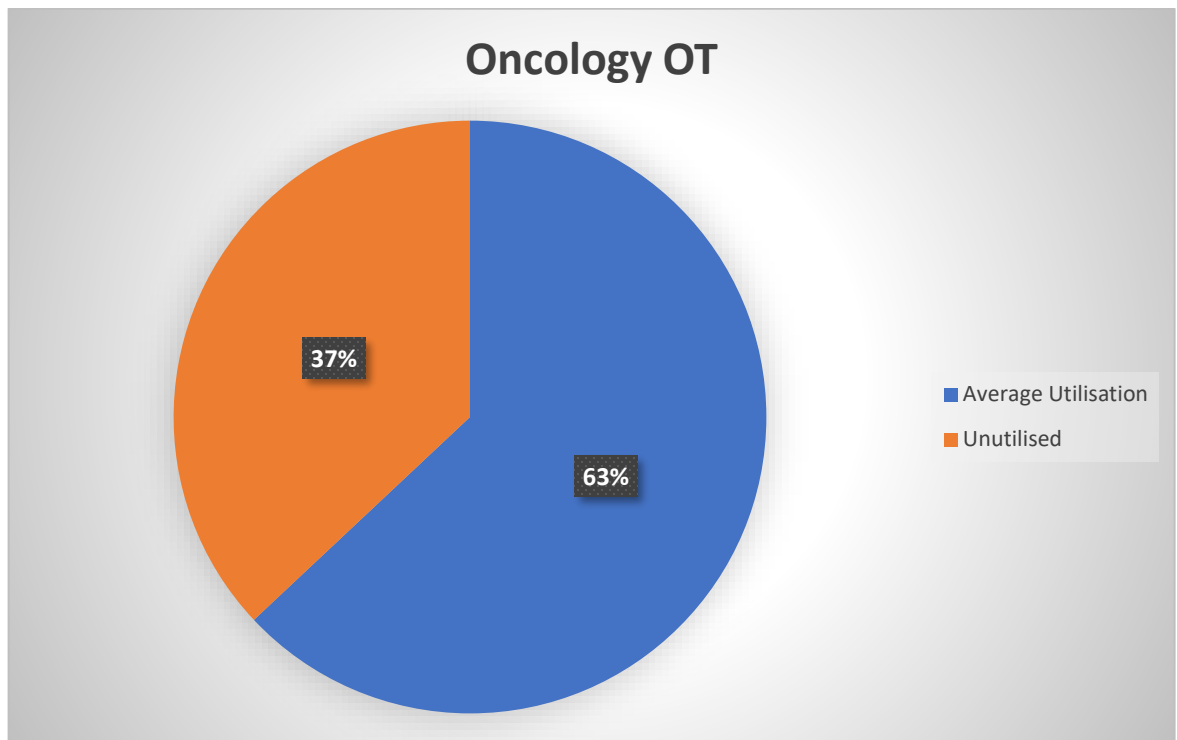


Fig. 8: Figure depicts the average utilisation rate versus percentage of unutilised OT in Oncology Surgery OT in the duration of 8 weeks during normal working hours. It is observed that 63% OT is utilised and 37% is unutilised. There is scope for improvement to increase the utilisation rate.

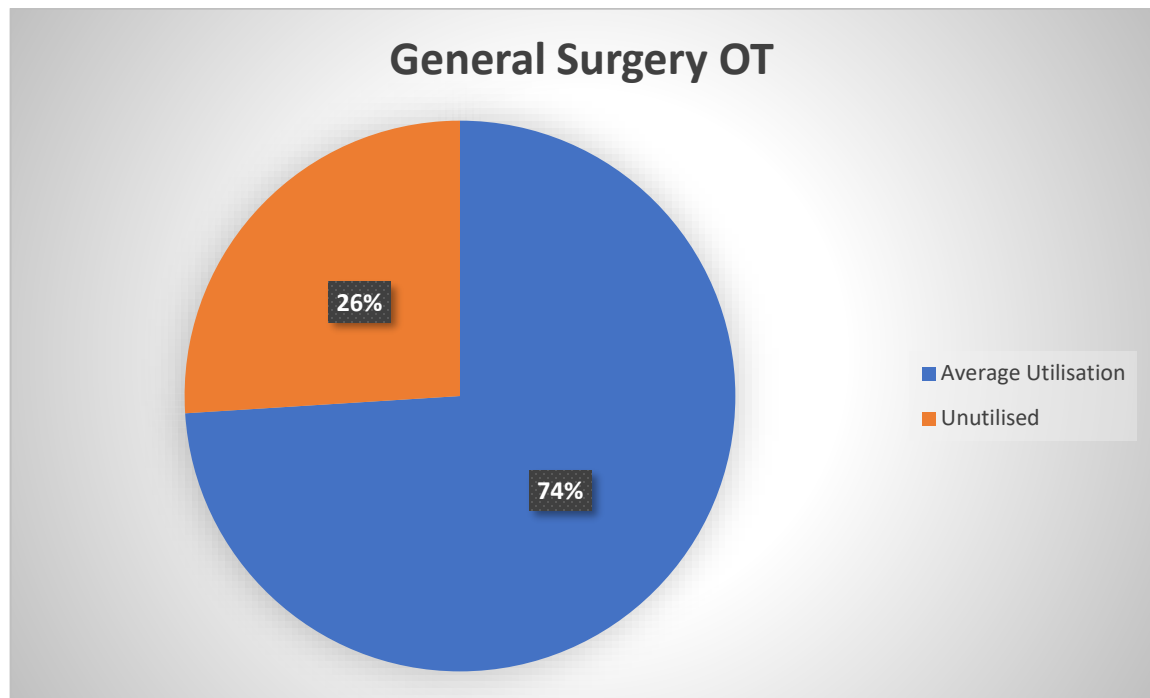


Fig. 9: Figure depicts the average utilisation rate versus percentage of unutilised OT in General Surgery OT in the duration of 8 weeks during normal working hours. It is observed that 74% OT is utilised and 26% is unutilised. This means that the utilisation rate is sufficiently good and can be improved in future.

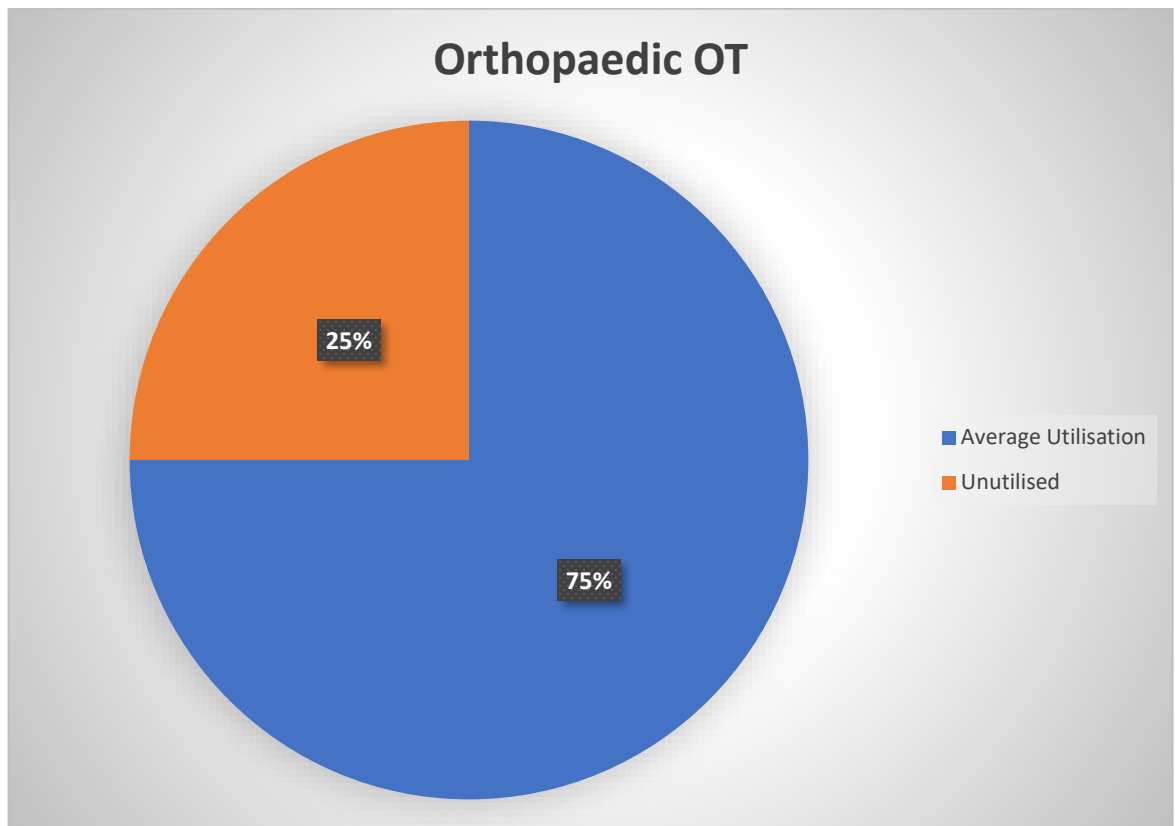


Fig. 10: Figure depicts the average utilisation rate versus percentage of unutilised OT in Oncology Surgery OT in the duration of 8 weeks during normal working hours. It is observed that 75% OT is utilised and 25% is unutilised. Here the utilisation rate is good and can reach up to optimal utilisation.

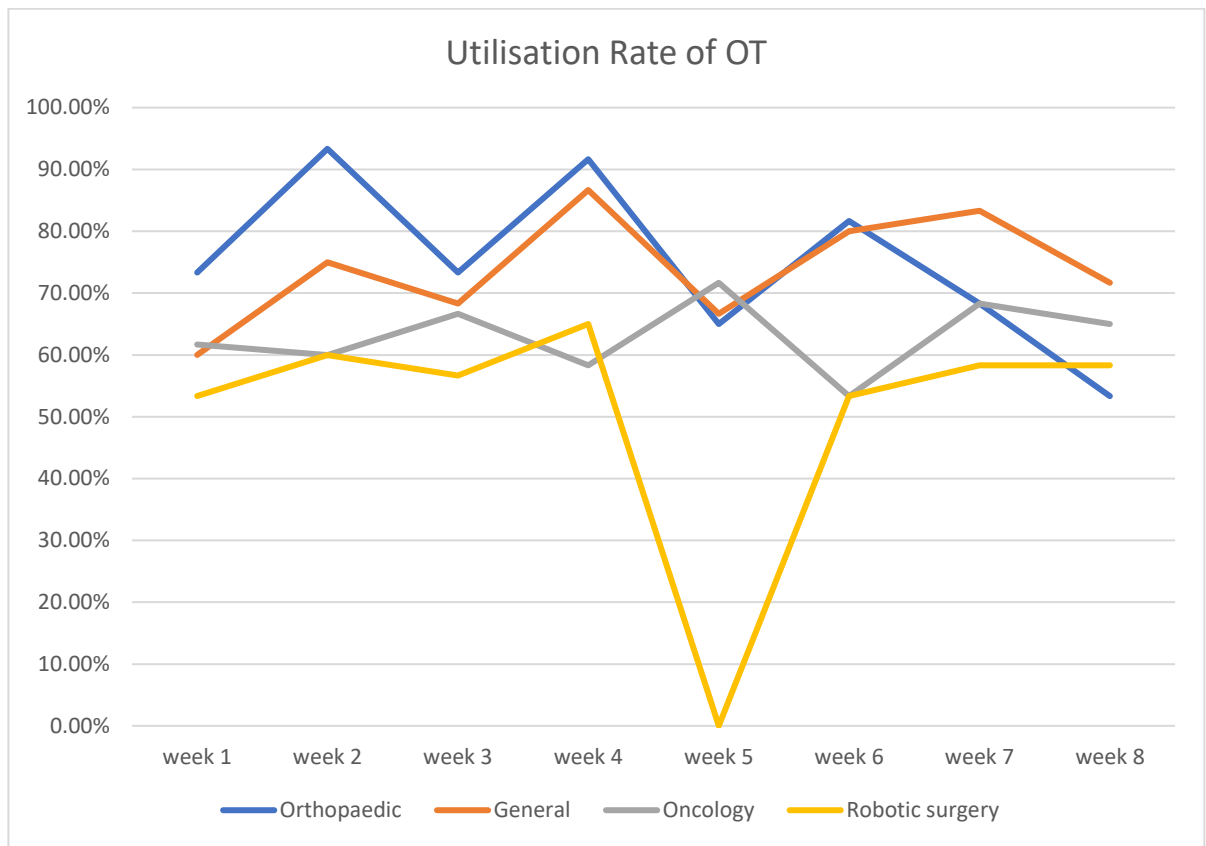


Fig. 11: Figure depicts the average weekly utilisation rate of all surgeries in the duration of 8 weeks during normal working hours in 4 OTs. It is observed that utilisation rate of robotic surgery OT dropped in 5th week and gradually increased in 6th week. Oncology surgery OT utilisation rate increased in 5th and 7th week while decreased in 4th week. Utilisation rate of orthopaedic surgery OT increased many times in 2nd, 4th and 6th week while decreased in 5th week. General surgery OT was used optimal in 4th week and least utilised in 5th week. 7

2) To identify the most common reasons behind the delays of scheduled surgeries.

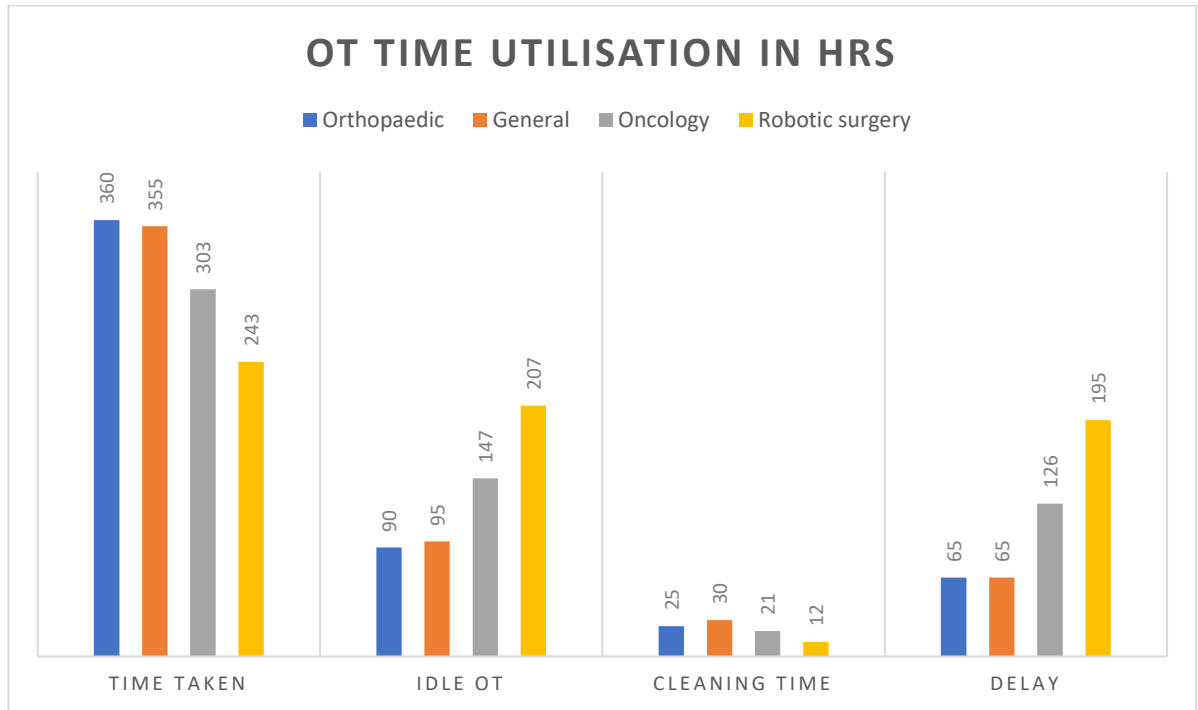


Fig. 12: Figure depicts the weekly time utilisation of all surgeries in the duration of 8 weeks during normal working hours in 4 operation theatres. It is observed that Robotic Surgery operation theatre has maximum idle time followed by Oncology operation theatre, followed by General Surgery operation theatre and least in Orthopaedic operation theatre. This shows that delay is caused maximum in Robotic Surgery operation theatre, and this can be because a smaller number of cases are performed in this operation theatre. Delay is also caused in Oncology operation theatre and reason behind this can be because of delay in shifting the patient to operation theatre from wards or delay in start of surgery. Minimum delay is observed in General and Orthopaedic operation theatre and reason behind this can be delay in insurance clearance or delay in start of surgery.

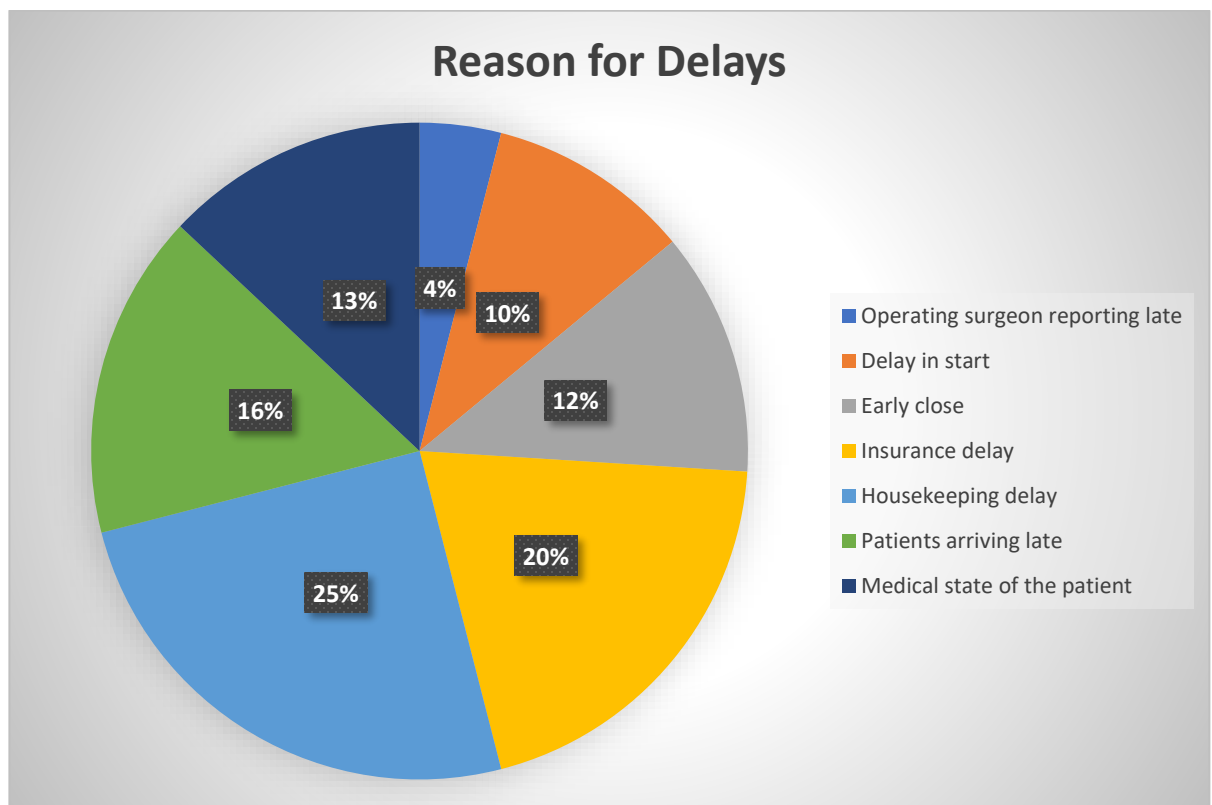


Fig. 13: Figure depicts reasons for delay in the surgical intervention performed in the duration of 8 weeks during normal working hours in 4 operation theatres. It is observed that maximum delays are due to housekeeping staff for shifting the patient late inside the operation theatre, followed by insurance delay, patient arriving late for the surgery, medical state of the patient, early close and delay in start of surgery. Minimum delay is due to surgeon reporting late.

DISCUSSION:

The OT is one of a hospital's most costly divisions. Because operating time costs money, efficiency in the operating room should be promoted. The real OT use in each hospital must be identified. It is imperative to make a concerted effort to cut down on unnecessary theatre breaks. It is doable to reach utilisation rates of between 70% and 80%, which may adapt to changes in demand brought on by challenges encountered during procedures. Several descriptive studies support this finding. It may be concluded that, except for the Robotic Surgery OT, OT utilisation in Apollo Hospitals is good and can be increased to reach up to optimal level with proper efforts.

Comparison of utilization of operation theatres in the period of 8 weeks from April 2023 to May 2023 in 4 departments was observed. Surgical procedure delays as well as the reasons behind the cancellations of surgeries due to overrunning of the lists and not reaching proper or optimal utilization of theatre time are the most common occurrences throughout the world. Numerous reports have demonstrated how doing this wastes time in the operating room and extends the hospital stay of the patient, increasing costs. The number of surgeries performed during April 2023 to May 2023 is 527. 264 surgeries were performed in the month of April while 263 surgeries were performed in the month of May 2023. Both the months witnessed maximum surgeries being conducted in General OT and minimum surgeries were conducted in Robotic surgery OT. In the period of 8 weeks, it was observed that number of surgeries in Oncology OT and General OT were increased whereas number of surgeries in Orthopaedic OT were significantly decreased.

Total available hours from April 2023 to May 2023 for all the 4 OTs was 450 hours out of which on an average 315 hours were used. 360 hours were utilised by Orthopaedic OT, 355

hours were utilised by General OT; 303 hours were utilised by Oncology OT and 243 hours were utilised by Robotic surgery OT.

Overall utilization percent of 4 OTs in April 2023 to May 2023 was 75 %, 74 %, 63 % and 51 % respectively for Orthopaedic OT, General surgery OT, Oncology OT, and Robotic surgery OT. The study period is divided in 8 weeks to study and comprehend week-by-week variations in the hospital utilisation rate, this differentiation is made. For the calculation of the utilization rate of OT, we can use the following formula:

$$\frac{\text{Total Operation Theatre Hours used}}{\text{Total available Operation Theatre equipped hours}} \times 100$$

The total operation theatre hours used is calculated by the total hours when the operation theatre was used for the surgeries and from those hours the cleaning time is excluded. The total number of operational theatre hours that were completely stocked with all necessary resources during working hours is used to compute the total operational theatre equipped hours. Operation theatre working hours is taken as 8:00 am to 6:00 pm and total hours available per day is 10 hrs.

Robotic surgery operating rooms are found to have the most downtime, followed by oncology operating rooms, general surgery operating rooms, and orthopaedic operating rooms. This demonstrates that delays are most common in the operating room for robotic surgery, which may be related to the fact that fewer patients are handled there. Oncology operating rooms are also subject to delays, which can result from holding up the patient's transfer from the hospital or delaying the start of the procedure. Minimum delay is observed in General and Orthopaedic operation theatre and reason for this can be delay in insurance clearance or delay in start of surgery.

Maximum delays are attributed to housekeeping staff for relocating the patient late inside the operation theatre, followed by insurance delay, patient arriving late for the surgery, medical state of the patient, early close and delay in commencement of surgery. The surgeon reporting late is the least of the delays.

Recommendations:

Here are few recommendations which can help to increase utilisation of Operation Theatres:

- Accurate estimates of case duration can prevent delay of subsequent surgery.
- In the preoperative area, visual dashboards can provide real-time patient tracking and status updates.
- Separate operation theatre should be dedicated to only emergency cases so that scheduled surgeries won't be delayed because of it.
- Preoperative workups, such as consultations and investigations can be included into electronic check lists so that tasks that must be finished prior to admission on the day of surgery can be tracked for completion. This can minimise the possibility of the surgery day cancellations and even patient can search for unfinished preops.
- Time management trainings for the operation theatre staff and doctors may help to achieve a mindset shift to emphasise the value of operation theatre utilisation.
- Training and management of housekeeping staff is necessary for avoiding the delay in shifting the patient to operation theatre.

CONCLUSION:

From April 2023 to May 2023, an overall utilisation rate of 4 operation theatres of 75%, 74%, 63%, and 51% for orthopaedic, general, oncology, and robotic surgery, respectively. The largest downtime is observed in operating rooms for robotic surgery, followed by those for oncology surgery, general surgery, and orthopaedic surgery. This shows that delays for robotic surgery occur most frequently in the operating room, which may be connected to the

fact that a smaller number of surgeries are scheduled per day. Oncology operating rooms are also prone to delays, which might occur because of delay in patient's transfer from the wards or delaying the commencement of the treatment. The general and orthopaedic operating rooms see the fewest delays, which can be attributed to either a delay in insurance authorization or a delay in the start of the procedure. Overall, the patient's late relocation into the operating room is blamed for the most delays, followed by insurance delays and patient errors. The following suggestions can aid in boosting the use of operation theatres such as accurate case duration estimations can avoid postponing follow-up surgery, visual dashboards can give real-time patient tracking and status updates in the preoperative setting so that scheduled procedures won't be postponed as a result, a separate operating room should only be used for emergencies, preoperative workups, such as consultations and investigations, can be added to computerised to-do lists, allowing for the tracking of tasks that need to be accomplished before admission on the day of surgery. This can lessen the likelihood that the surgery day will be postponed, and the patient can even look for unfinished preops. Lastly, the operation theatre staff and doctors may benefit from time management training.

ANNEXURE

For Collection and Analysis of Data

OT No.	PROCEDURE NAME	WHEEL IN	WHEEL OUT	DURTION	STATUS	REASON FOR DELAY

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